

## PARAFFIN CASTS OF URETERAL CALYCES, PELVES, AND URETERS.

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SOME studies in paraffin and corrosion anatomy are here presented, demonstrating (*a*) three constant ureteral dilations; (*b*) three constant ureteral constrictions or isthmuses. The specimens were painted with white lead before being photographed.

The plate here given (Plate IV) presents half-life size the form of the ureters filled with melted paraffin under equal pressure, demonstrating (*a*) the ureteral dilatations, spindles, or reservoirs (1, 2, 4, 6); (*b*) the ureteral constrictions, isthmuses, sphincters (3, 5, 7). Some different forms of isolated calyces and pelves of different ages and animals are also presented.

Nos. 55 (left) and 56 (right); man, aged forty years. This pair presents usual calyces (1, 1, left). The forms, non-symmetrical, of the pelves (2, 2) are well developed, but differ markedly on each side. The proximal isthmus (3), left, distinct, distalward located; right (3), it is indistinct and distalward in location (symmetrical); size, non-symmetrical. The lumbar spindle (4), right, well developed; left, slightly developed; size, non-symmetrical, location symmetrical. The middle isthmus (5), left, indistinct; right (5), distinct; size unequal, location symmetrical. The pelvic spindle, left, one large proximal (6) and one small distal (6) right, an indistinct proximal (6) and a well-developed distal (6). The distal isthmuses (7, 7) are smaller in caliber than the proximal (3, 3). The right (56) is an inch longer than the left (55), which is rare.

Nos. 57 (left) and 58 (right); man, aged sixty years. This pair presents slightly developed, elongated, symmetrical

form and equality in size of pelves (2, 2). The proximal isthmus, left (3), is indistinct and proximally located; right (3), well marked and distally located, non-symmetrical in location and unequal in size. The lumbar spindle, left (4), presents two small short spindles; right (4), a distinct proximal and a small distal one, non-symmetrical in location, unequal in size, similar in number. The middle isthmus (left) indistinct; right, marked, non-symmetrical caliber and location. The distal isthmuses (7, 7) are about equal in caliber with the proximal (3, 3). The right ureter (4, 4) is longer by three-fourths of an inch than the left (58). The pelvic spindle, left (6, 6*a*, 6*b*), presents three spindles; right (6, 6*a*, 6*b*) shows three small spindles, non-symmetrical in size, location, and number.

Nos. 59 (left) and 60 (right); boy, aged four years. This pair presents typical constrictions and dilatations from a young child. They present usual pelves (2). Right, marked proximal isthmus (3), left less distinct, more distally located, proximal isthmus (3) non-symmetrical in location. Right, prominent lumbar spindle (4); left, marked lumbar spindle (4); bilaterally symmetrical in form and location. Bilaterally symmetrical in form and size, middle isthmuses (5, 5). Right, two pelvic spindles (6, 6); left, three (6, 6, 6). Practically bilaterally symmetrical. The distal isthmuses (7, 7) were less in lumen than the proximal (3, 3). Bilaterally quite symmetrical ureters.

Nos. 61 (left) and (right) 62, pair of dog's ureters presenting bilaterally distinct lumbar and pelvic spindles. The naked eye can note them, but the magnifying lens of four diameters demonstrated them well. (3, 3) Proximal isthmus, (4, 4) lumbar spindles, (5, 5) middle isthmuses, (6, 6) pelvic spindles. (7, 7) The distal isthmuses were smaller in lumen than the proximal (3, 3).

Nos. 63 (left) and 64 (right); newly-born infant. This pair presents distinct, bilaterally symmetrical in form and size, proximal isthmuses (3, 3). Marked bilateral lumbar spindles (4, 4). Right, prominent; left, well marked lumbar spindle.

Indistinct middle, bilaterally non-symmetrical, isthmuses (5, 5). Right, indistinct; left marked pelvic spindles (6, 6). Distal isthmuses (7, 7) and proximal (3, 3) about the same in lumen.

Nos. 65 (left) and 66 (right); man, aged sixty-six years. This pair of ureters presents the most typical forms of constrictions and dilatations, but they were injected with celloidine, which, after evaporation of the alcohol and ether, allowed regular contraction of the ureters.

Nos. 67 (left) and 68 (right); man, aged fifty-five years. This bilaterally double pair of ureters presents short, irregular, ill-defined calyces (1, 1, 1, 1). Bilaterally, symmetrically located double pelvis (2, 2, 2, 2). The distal pelvis (2, 2, 2, 2) are the larger, possessing larger and more defined calyces (1, 1, 1, 1). Right, the proximal pelvis is fairly developed, elongated (2, 2). The distal pelvis (2, 2) is flat, moderately developed. Left, the proximal and distal pelvis (2, 2, 2, 2). Right ureter, the proximal isthmus of the distal pelvis is limited in caliber (3). The proximal isthmus of the proximal pelvis is difficult to locate. It may be 3 or 3a. The distal portion of the right ureter of the double pelvis is single for over two-thirds of its length. Double lumbar spindle (4, 4). Indistinct middle isthmus (5), well developed pelvic spindle. Left ureter, the proximal isthmuses are ill defined though apparently well proximally located, and also presenting a bilaterally double lumbar spindle (4, 4, 4, 4). The left ureter is double for its whole length, having two orifices in the bladder, as demonstrated by the two pins inserted in them. It appears to coalesce at its distal end, but the lumen of each ureter is distinct. There appears to be bilaterally, non-symmetrically located two lumbar spindles (4, 4, 4, 4). The middle isthmuses (5, 5) are moderately developed. There is bilaterally, symmetrically located, and irregular in size, double pelvic spindles (6, 6, 6, 6). The distal isthmuses (7, 7) smaller in lumen than the proximal (3, 3). Double ureters have occurred four times in this series of 100 cases. Once bilaterally

double; twice unilaterally double; one unilaterally double pelvis and ureter for the proximal fourth.

No. 69. Pig calyces (1, 1) and pelvis (2).

No. 70. Man, aged —; paraffin cast of calyces (1, 1), pelvis (2), and proximal isthmus (3).

No. 71. Paraffin cast of calyces (1, 1), pelvis (2), and proximal isthmus (3) of a newly-born infant.

No. 72. Paraffin cast of a pig. Calyces (1, 1), pelvis (2), and marked isthmus (3).

No. 73. Paraffin cast of a man. Calyces (1, 1), pelvis (2). The pelvis was pathological, dilating, irregular.

Nos. 74 (left) and 75 (right); man, aged forty-eight years. This pair of ureters presents well-developed pelvis, especially the left (2, 2). Indistinct, proximal, but non-symmetrical located proximal isthmus (3, 3), marked bilateral; symmetrically located, unequal in diameter and length, lumbar spindles, middle isthmuses (5, 5) bilaterally symmetrical, unequal in diameter, moderately marked. Pelvic spindles (6, 6, 6, 6) bilaterally double, non-symmetrical in diameter, location, and length. Distal isthmuses (7, 7) less in diameter than the proximal (3, 3). A rare feature is that the right ureter is three-fourths of an inch longer than the left.

No. 76. Segment of a sheep ureter, showing spindles, lumbar (4) and pelvic (6), with isthmuses, proximal (3), and a pelvic constriction at (a).

Nos. 77 (left) and 78 (right); man, middle age. This pair of ureters presents a double pelvis (2, 2) on the left, with divided ureter for its proximal fourth. The right ureter has a single pelvis (2) moderately developed. The proximal isthmuses (3) are bilaterally symmetrical in diameter, but not in location. The lumbar spindles (4, 4) are marked, bilaterally, non-symmetrical in diameter and location. Middle isthmus (5, 5) marked, pelvic spindles (6) left, a small and a large spindle (6, 6). Right, three consecutive indistinct spindles (6, 6, 6). The distal isthmuses (7, 7) were smaller in lumen than the proximal (3, 3). The left ureter (7, 7) is longer by one and one-half inches than the right (7, 8). The

calyces, pelves of the double ureter as well as the free pelves (69, 70, 71, 72, 73) of man and animals are the result of corrosion by  $\text{HNO}_3$ . The ureteral isthmuses (3, 5, 7) are points liable to obstruction from calculi, flexion, or torsion. The ureteral dilatations (1, 2, 4, 6) are points for surgical intervention from ample lumen and wall. All surgery must be limited at the ureteral isthmuses (3, 5, 7) from limited diameter and wall for manipulation. Some of the specimens of this plate I removed at autopsies by the courtesy of Professor W. A. Evans, others were secured for me by Dr. Fred. Harris and the Cook County internes. Additional specimens were secured for me by Drs. Ludlow and Savage. Dr. William E. Holland executed the photograph. For aid in securing the specimens, I am indebted to Drs. W. A. Evans and Fred. Harris.